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Africa's Genetic Secrets Unlocked

Victoria Gill

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By Victoria Gill
Science Reporter, BBC News
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A genetic map of Africa -- the continent from which all modern humans originate -- has provided information about its huge diversity of language and culture.

It is the result of the largest African genetic study ever undertaken.

The work revealed the continent to be the most genetically diverse place on Earth, and identified descendents of our earliest human ancestors.

The international team of scientists describe their 10-year study in the journal Science.

The team, led by Sarah Tishkoff from the University of Pennsylvania, studied genetic material from 121 African populations.

They collected over 3,000 samples, and identified 14 "ancestral population clusters". These are groups of populations with common genetic ancestry, who share ethnicity and similarities in both their culture and the properties of their languages.

"This is a spectacular insight into the history of African populations and therefore the history of mankind," said Muntaser Ibrahim, a researcher from the University of Khartoum, who was also involved in the study.

The team looked at individual ancestry, or genetic similarities in their samples, by comparing the frequencies of more than 1,000 DNA markers -- sections of the DNA code that are known to reveal common genetic heritage.

"In the past, [geneticists] studied just a few Africans, and suggested they were representative of the continent, but we've found that no population is representative of all of this diversity," said Dr. Tishkoff.

"Our goal has been to do research that will benefit Africans," she said. "I hope this will set the stage for future genomics research there, and future biomedical research."

The completion of the study could enable such research, allowing the link between genes and disease to be properly studied.

"The genetic variants we've identified may play a role in disease susceptibility and the different ways in which people respond to drugs," Dr. Tishkoff explained.

Remote Research

Her team had to gather genetic samples from some of the continent's most remote communities.

To extract the important information from blood samples, they have to be "spun down", using a centrifuge to produce a pellet containing the DNA.

"In the most remote areas, we used a centrifuge that plugged into a car battery," Dr. Tishkoff recalled.

A Village in Tanzania that participated in the study. Photo by Sarah Tishkoff, University of Pennsylvania.

Largely as a result of these difficulties, a large amount of the group's data comes from populations that have never previously been studied genetically.

This allows the map to provide an entirely new link between biology, and existing anthropology and linguistic information.

The research also located the origin of modern human migration in south-western Africa, near the coastal border of Namibia and Angola.

To operate in remote areas, some equipment had to run on a car battery. Photo by Sarah Tishkoff, University of Pennsylvania.

This is based on the widely-accepted theory that the highest level of genetic diversity is in the oldest population -- the one that has had the longest to evolve.

The site is the homeland of the indigenous San communities, Dr. Tishkoff explained.

"It's not surprising but it's a very neat finding because the San have already been shown to have the oldest genetic lineages, suggesting they may be descendents of a population ancestral to all modern humans."

Genetic Reconstruction

The data has revealed a great deal about the history of the continent. "This is the first time we have had the genetic data to reconstruct migration events," Dr. Tishkoff commented.

Her team, which represented an variety of academic disciplines, showed how genetic and linguistic diversity have co-evolved. This analysis revealed some surprises.

"The Masai people [in Kenya], for example, have maintained their traditional language and pastoral lifestyle, but genetically they've mixed a lot with populations from Ethiopia [who speak a different language]," said Dr. Tishkoff.

The researchers also took samples from four African American populations, and traced their African ancestry. This was, as expected, mostly pinned down to West Africa.

Mark Thomas from the Department of Genetics, Evolution and Environment at UCL praised the study, and said that the level of diversity discovered was "broadly what we would expect".

He added that because the origins of African American ancestry can be seen "all the way from Senegal down to Angola, it will be a long time before a DNA test will be able to identify someone's ancestral origin."

"That's despite the ridiculous claims of some of these DNA testing companies."